



**Hood Canal Coordinating Council**  
Hood Canal Aquatic Rehabilitation Program

**Technical Advisory Committee Meeting**  
Kitsap Conference Center at Bremerton Harborside  
100 Washington Avenue, Bremerton, WA

September 1, 2009  
9:00 a.m. – 4:30 p.m.

**Summary**

The HCCC Technical Advisory Committee (TAC) for Low Dissolved Oxygen held an all day meeting on September 1, 2009. The purpose and expected outcomes of the meeting were as follows:

**Purpose and Expected Outcomes:**

- Technical Committee participants understand:
  - The findings of the Hood Canal Dissolved Oxygen Program research;
  - The role of the Clean Water Act;
  - Federal, Tribal, State, and Local authority for addressing Low Dissolved Oxygen;
  - Corrective actions that have been implemented, planned, or considered.
- Recommendations for HCCC Board of Directors including:
  - The goal of addressing low dissolved oxygen in Hood Canal: *A proposed goal for the TAC to consider is to remove Hood Canal from the list of impaired water bodies under the Clean Water Act.*
  - The goal of the TAC: *A proposed goal for the TAC to consider is to develop a recommended action plan that will lead to the removal of Hood Canal from the list of impaired water bodies.*
  - Structure of an action plan for removing Hood Canal from the list of impaired water bodies for dissolved oxygen under the Clean Water Act.
  - Identifying, and agreeing on, next steps – TAC and possible Work Groups.

**Recommendations**

As a result of presentations and discussions during the meeting, the TAC adopted the following as recommendations for the HCCC Board to consider (details of the Committee's discussion are described below):

- 1) The goal of addressing low dissolved oxygen in Hood Canal is to remove Hood Canal from the list of impaired water bodies under the Clean Water Act and to keep it off the list. The goal is also to ensure a healthy Hood Canal watershed (freshwater and marine areas) in perpetuity.

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- 2) The goal of the TAC is to develop a recommended action plan that will lead to the removal of Hood Canal from the list of impaired water bodies and will keep it off the list.
- 3) The action plan should include the following elements:
  - a. Measurable, numerical targets
  - b. Cost/benefit analysis and risk assessment relative to the recommended actions
  - c. Monitoring, including compliance and effectiveness monitoring
  - d. Identification of who will be involved and who will enforce recommended actions
  - e. Clearly articulate how the recommended actions contribute toward the program goal
- 4) The following topics will be addressed in TAC work groups:
  - a. Wastewater, including on-site septic systems
  - b. Land use including housing, stormwater, development, and growth management
  - c. Agriculture
  - d. Forestry
  - e. Riparian corridor health, restoration and protection
  - f. Nearshore health, restoration and protection
  - g. Communications, public education, and outreach strategy
- 5) Schedule: By end of 2009, the TAC will have developed a detailed approach to preparing an action plan. By October 2010, the TAC will be far enough along in identifying specific tasks and activities for policy makers to use the draft action plan to seek funding.

## **Overview and Discussion of Hood Canal Dissolved Oxygen Program (HCDOP) Findings with emphasis on questions from HCCC Board.**

Jan Newton, co-manager of HCDOP and HCDOP- Integrated Assessment and Modeling (IAM) Principal Investigator, presented the results of scientific research that has been conducted to better understand the processes that affect dissolved oxygen in Hood Canal. Dr. Newton addressed the following key questions that had emerged from interviews and discussions with members of the Hood Canal Coordinating Council Board of Directors.

- What are the primary sources of non-human N contributions and low DO conditions?
- What are the categories of "primary" human sources of Nitrogen?
- Where is each primary human source of N coming from geographically in Hood Canal?

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The following HCDOP-IAM scientists were present to answer questions from meeting participants during and after the presentation.

Scott Bechtold	University of Washington School of Aquatic and Fishery Sciences
Allan Devol	University of Washington School of Oceanography
Edward Josberger	US Geological Survey Washington Water Science Center
Mitsuhiro Kawase	University of Washington
Rich Sheibley	US Geological Survey Washington Water Science Center
Gary Turney	Co-Principal Investigator HCDOP-IAM; US Geological Survey

Comments and questions from meeting participants are summarized below.

**Question:** When nitrogen loading to Hood Canal occurs in the winter, is that nitrogen still present by summer?

**Response (Al Devol):** We don't have the data with us today, but you would expect if nitrogen in Lower Hood Canal is staying available for some period of time, the nitrogen concentration in the water would increase over time. We found that the nitrogen concentration does not increase, which would indicate that the residence time is not more than a month.

**Response (Mitsuhiro Kawase):** We also studied the effect of carbon loading in Hood Canal and found that the flushing time was about three months. Therefore, nitrogen that reaches the Canal in winter will probably wash out before spring/summer.

**Question:** Do you have information about nitrogen sources other than on-site septics?

**Response (Al Devol):** We looked at on-site septics, red alder, and "other domestics," including fertilizer and pet waste, as sources. We have a limited ability to determine the individual sources within the category of human sources of nitrogen.

**Question:** What is the land use where red alder is present? Is it mixed use, clearing for housing, and/or forestry?

**Response (Al Devol):** Red alder is found anywhere there is disturbance of conifer forest, including disturbed riparian areas and land clearing for housing or timber.

**Question:** The information that human sources of nitrogen contribute about 0.8 mg/L to the decrease in dissolved oxygen in lower Hood Canal is a helpful message regarding the importance of maintaining on-site septic systems in the summer months. Is the on-site septic contribution from the shoreline only or from the whole watershed?

**Response (Al Devol):** The focus is mainly on on-site septic contributions from the shoreline area, although there is some from the broader watershed.

**Question:** Could you explain why more denitrification occurs in streams than in groundwater?

**Response (Scott Bechtold):** Denitrification requires carbon, nitrate, and anoxic

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conditions. Small streams have large benthic surface areas relative to volume (compared to larger streams) where these conditions occur.

**Response (Rich Sheibley):** The exchange of groundwater with surface water fuels denitrification, so the permeability of the stream bed matters. Nitrogen is also taken up by algae in streams, but true loss from the system is denitrification when nitrate is converted to nitrogen gas, which is released to the atmosphere.

**Question:** How is nitrogen released from alder?

**Response (Scott Bechtold):** Alder trees have a bacterium associated with their roots that fixes nitrogen. Most of the nitrogen is taken up by the tree and returned in litter fall in the autumn. If there is a dry spell, some of the roots and the bacteria will senesce, so nitrogen that is not taken up by the tree can be washed away by rain. If there is an extended period of dry weather in summer and then a storm, a pulse of nitrogen can be seen. Nitrogen loading from alders is more common in the fall though.

**Question:** Don't floodplains take up nitrogen?

**Response (Scott Bechtold):** Floodplains tend to be sources of nitrogen rather than a nitrogen sink. Alders grow in floodplains, which is one reason why they tend to be a source.

**Question:** Do your nitrogen loading estimates account for functioning, code-compliant on-site septic systems versus failing systems?

**Response (Scott Bechtold):** No, there is no differentiation.

**Comment:** On-site septics do not completely remove nitrogen even when they are functioning properly.

**Question:** Please discuss the uncertainty pertaining to the 1.9 MT/month nitrogen loading figure for lower Hood Canal.

**Response (Scott Bechtold):** There is big uncertainty. We estimated the amount of nitrogen loading using multiple methods: one by doing a water balance based on water yielded per acre throughout the watershed and some measurements of total dissolved nitrogen concentrations from elsewhere. A second method was to calculate using the number of people in lower Hood Canal, the average amount of septage produced per person, and an assumption about the level of nitrogen removal from septage.

**Response (Jan Newton):** Population numbers were based on the 2000 census. A third method used the model.

**Response (Scott Bechtold):** We are working to refine the seasonal population numbers using some sort of census. In the past we have used traffic records, which is a blunt instrument.

**Comment:** So, the main source of nitrogen during the summer, when sunlight is available, is on-site septic systems, not alders.

## Development of an action plan: Options for Regulation, Management and Implementation of Actions to Address Low DO in Hood Canal.

### Part A: EPA/Ecology Panel

Tom Eaton, US Environmental Protection Agency, and Kim McKee, Washington State Department of Ecology, gave a brief presentation about the process of listing a water body as impaired under the Federal Water Pollution Control Act (Clean Water Act) and options for removing it from the list of impaired waters. They also discussed Washington State's role in administering the Clean Water Act. Dave Garland, Washington State Department of Ecology, participated in responding to comments and questions from meeting participants, which are summarized below.

**Question:** Where is the dividing line between the Department of Ecology's Northwest Region and Southwest Region in Hood Canal?

**Response (Kim McKee):** If you drew a line down the center of the mainstem, that is the split between the Northwest and Southwest regions. The Mason County boundary is also the dividing line between the regions.

**Question:** Have the scientists considered the contribution of phosphate-based herbicide in lakes and domestic use of Round-Up?

**Response (Kim McKee):** The marine environment is not phosphorous limited as is the freshwater environment, so phosphorus has not been part of their research.

**Question:** Does the State have plans to establish a water quality standard for nitrogen?

**Response (Tom Eaton):** There are no plans to adopt either a nitrogen or a phosphorus standard. The Department of Ecology relies on understanding the connection of nitrogen and phosphorus to dissolved oxygen, which has a more direct relationship to the beneficial uses they are trying to protect.

**Question:** If Hood Canal is divided into multiple regions, how would an action plan be structured to meet water quality standards?

**Response (Tom Eaton):** An action plan is for the water body, regardless of which regions it occupies. The State divides water bodies into a grid system and stream segments. Impaired water bodies are designated based on monitoring data from various sources, so it may be that only certain grid sections or stream segments are listed. Some areas are not monitored, so they may not be listed even though they do not meet water quality standards.

**Question:** Under a Total Maximum Daily Load (TMDL) process, it is difficult to deal with non-point sources. In Hood Canal, unlike a watershed, there is no point where pollutants are carried where they might be easily measured. How can non-point sources like on-site septic systems and alders be handled?

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**Response (Dave Garland):** Implementation approaches can include education and outreach about changing behavior along with regulatory approaches to, for example, on-site septic systems.

**Response (Kim McKee):** We have had mixed success with non-point sources around the state. The solutions for agriculture and livestock are no different than what needs to be considered here. Right now a path of voluntary compliance is being followed in Hood Canal. We need to consider a mixture of education with some kind of enforcement as well. Conservation districts will play an important role. We need to think about ways to direct resources through the Washington Forest Practices Board and federal support to the State Revolving Fund. We need to look at ways to help local governments deal with the economic impact of working to improve water quality.

**Comment:** It would be helpful to have a map or some other depiction of the locations of impaired waters and the processes that govern water quality there. If you have a narrative water quality standard, it would be helpful for people to understand what processes we are trying to influence.

**Response (Tom Eaton):** That is true, although the water quality standard is also numerical. The total human influence (from on-site septic and other domestic influences) is currently 0.8 mg/L, and the standard dictates that total human influence cannot exceed 0.2 mg/L.

**Comment:** In Mason County, the public has been responsive at meetings about future wastewater treatment facilities to low dissolved oxygen graphics produced by HCDOP-IAM.

**Question:** Are there nitrogen performance standards for on-site septic systems in marine recovery areas?

**Response (John Eliasson, Washington State Department of Health):** There are no statewide rules regarding nitrogen, in recognition that nitrogen has to be handled on a regional basis. That does not preclude a region or a county from addressing local conditions.

**Response (Dave Garland):** Nitrogen-reducing technologies for on-site septic systems are onerous to implement throughout a watershed, but they should be considered. I have seen failing on-site septic systems right on the edge of streams, which has a huge impact on water quality. Inspections and renovations where needed are important. It is difficult to measure or enforce standards for effluent coming off of on-site septic systems.

**Question:** What is the enforcement mechanism under the Clean Water Act to ensure local jurisdictions address an impaired water body? What happens if there is no action?

**Response (Kim McKee):** Without action at the local level, eventually the Department of Ecology will have to prepare and enforce a TMDL. Also, preparing an action plan can help a region secure funding.

**Comment:** An action plan will need to include measurable targets, provisions for monitoring and compliance, and identification of responsible parties.

## **Part B: Hood Canal Panel**

Representatives of the Port Gamble S'Klallam Tribe, Skokomish Tribe, Jefferson County, Mason County, and Kitsap County Health District each spoke briefly about their respective jurisdictions' efforts to address low dissolved oxygen. They also offered their perspectives on the proposed goal for addressing low dissolving oxygen.

Paul McCollum, Port Gamble S'Klallam Tribe, said he agreed that trying to reduce total human influence on dissolved oxygen concentrations to 0.2 mg/L was a good place to start for a goal. He added that the precautionary principle should be used for policy while scientists learn more about the system and the effects of low dissolved oxygen on marine life. He said that, from the tribal perspective, the chronic effects of low dissolved oxygen on aquatic life deserve more attention.

Randy Lumper, Skokomish Tribe, noted that low dissolved oxygen is a standard of living issue as well as a water quality issue. He pointed out that the Skokomish Tribe makes a livelihood from marine life including crabs, shrimp, and oysters. He said the goal for addressing low dissolved oxygen should be not only to get off the list of impaired waters but to stay off of it.

Neil Harrington, Jefferson County Department of Public Health, said that Jefferson County has adopted many of the Kitsap County Health District's protocols for a Pollution Identification and Control (PIC) program. Jefferson County conducts door-to-door sanitary surveys to identify failing on-site septic systems and works with property owners to do repairs. The County also does shoreline surveys to look for seeps that are polluted. The County does outreach and education on how to maintain on-site septic systems and works with the Jefferson County Conservation District on agriculture-related problems. Mr. Harrington said that the Jefferson County Board of County Commissioners recently passed a fee ordinance for five dollars per parcel to protect shellfish. He said that that kind of secure funding source is essential for ongoing maintenance of water quality standards.

Emmett Dobey, Mason County Community Development/Utilities, spoke about Mason County's efforts to build sanitary sewer systems in multiple locations. He said Mason County views the dissolved oxygen problem as an economic issue, because the shellfish industry makes up about \$20 million per year of the County's economy. He said Mason County has a Department of Ecology grant to develop, along with the WSU Extension and the Mason Conservation District, a comprehensive coordinated approach to stormwater. Mr. Dobey emphasized that, given the huge expense of solutions like building sanitary sewers, science needs to clearly show that proposed actions will achieve the expected results. He noted it is very problematic from the public's perspective to hear conflicting scientific reports about the causes and potential remedies for low dissolved oxygen.

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Keith Grellner of the Kitsap Health District emphasized that a stable funding source is necessary to support the constant effort that is needed to manage water quality. He also said that on-site septic systems should be based on what they are intended to do and with which codes they were designed to comply. He explained that applying nitrogen-reducing technologies to on-site septic systems is complicated because the quality and volume of influent varies dramatically among properties. He said that Kitsap County Health District staff have learned from years of experience that, regardless of other variables, setting an on-site septic drainfield at least 100 feet away from water bodies makes a big difference in controlling water pollution.

The local and tribal government representatives agreed that the goal for addressing low dissolved oxygen should be, at least as a start, to remove Hood Canal from the list of impaired water bodies and then to maintain water quality standards. They agreed the goal should also focus on not worsening the problem through current or future activities and to ensure an overall healthy Hood Canal watershed (freshwater and marine areas) in perpetuity.

The local and tribal government representatives generally agreed that an action plan to address low dissolved oxygen should address all of Hood Canal, but with a focus on lower Hood Canal. It was noted that creating an action plan for all of the Hood Canal might appeal to funding entities more than focusing on only lower Hood Canal.

The local and tribal government representatives discussed the need to include near-term actions in the action plan, such as identifying and correcting failing on-site septic systems, focusing first in shoreline and river corridors. It has been shown in Kitsap County that correcting failing systems reduces nitrogen as well as bacteria.

The panel discussed other measures that might be considered, including the following:

- Developing more materials that help people understand the science, like images that show sources of pollution and other issues that may arise as the science is refined.
- Having US EPA and Department of Ecology develop a template for the design of wastewater treatment facilities that communities could adapt.
- Enforce health codes and take a public health approach to addressing failing on-site septic systems.
- Hood Canal-wide water quality monitoring.

Members of the panel and meeting participants discussed the role of the State Growth Management Act in determining where sanitary sewer systems may legally be built. This issue will be further discussed in future work group meetings. Additional questions and discussion items included the following:

**Question:** Do the Jefferson County, Mason County, and Kitsap County PIC programs use the same monitoring approach so their data can be compared?



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**Response (Emmett Dobey):** They are not the same now, but Department of Ecology has formed a regional monitoring group to look at standardizing the approach to monitoring stormwater.

**Response (Neil Harrington):** Jefferson County has a very similar monitoring approach to Kitsap County. Some monitoring is done by the Jefferson County Conservation District. Perhaps the Puget Sound Partnership can assist with consistent, long-term monitoring.

**Response (Debbie Riley, Mason County Department of Environmental Health):** Mason County has a database to track servicing for all on-site septic systems in the County.

Mason and Jefferson County consulted with Kitsap County when creating their Hood Canal PIC programs. Mason County's staff spent several days in the field, working alongside the Kitsap County staff. There were some slight changes to the methods (for example, MCPH did not collect flow measurements nor did we use the Before-After-Control-Impact Sampling Design (that Kitsap used), namely because we did not collect flow data). That being said, the monitored parameters were the same and for the initial parts of our projects we all used the same lab for the nutrient analysis. My understanding is that each of the counties had samples analyzed for fecal coliform and then in select areas, nutrient analysis (NH<sub>3</sub>-N, NO<sub>2</sub>+NO<sub>3</sub>-N and OP) were also performed. We used similar triggers for sanitary surveys of properties and similar databases to house the sanitary survey data in. I believe that all of our data sets are in the DOE's EIM database.

Mason County does not have a consistent funding source for their PIC program. Funding is currently through the Centennial Clean Water Fund Grants, however, this grant requires a 25% match. Lack of discretionary funds may mean Mason County cannot meet the match and continue to compete for funding. Sustainable funding is needed to continue water quality work.

**Question:** Has anyone kept records of the decline of crabs and shellfish in Hood Canal?

**Response (Randy Lumper):** Most data is from catch records. The Skokomish Tribe is working on a project to use acoustic tags to tag crab to see how the crab are moving. But the tribe has limited resources.

**Question:** How can we define "pristine" conditions for Hood Canal aquatic life?

**Response (Randy Lumper):** The term we use is "traditional ecological knowledge." Our biologists speak with the elders about past conditions. There was a document produced in the late 1800s about conditions at that time.

**Comment:** The tribes are concerned about long-term regulatory oversight of Hood Canal. For example, it seems like overwater structure like docks and buoys are increasing in the canal and the upper watershed. Is that sort of regulatory review beyond the scope of this committee?

**Response (Duane Fagergren, Puget Sound Partnership):** This is an important forum for making those kinds of recommendations to the Hood Canal Coordinating Council Board of Directors.

## Overview of Corrective Actions and Evaluation

### Part A:

- **What corrective actions are available? Which have been tried and to what effect? What is ongoing?**

Duane Fagergren, Puget Sound Partnership, gave a brief presentation about “corrective actions” that have already been taken, are underway, or are being planned to address low dissolved oxygen. Mr. Fagergren distributed two handouts that outline many of the corrective actions. He said that many of the corrective actions were identified in the *Hood Canal Low Dissolved Oxygen Preliminary Assessment and Corrective Action Plan* (PACA) (Fagergren *et al.*, 2004) published by the Puget Sound Action Team and the Hood Canal Coordinating Council.

Mr. Fagergren noted that the sanitary sewer system that will begin construction soon in Belfair would not have been affordable to the community without strong political support and funding from the state and federal levels.

In response to questions, Mr. Fagergren said the HCDOP-CAE group had tested six different technologies for reducing nitrogen output from on-site septic systems had been tested by the HCDOP-CAE group, but that the results were not encouraging. He acknowledged that some additional technologies that are used in Europe would be worth exploring.

Betsy Daniels, meeting facilitator, asked the group if it would make sense to hold sub-committee “work group” meetings in the future to discuss recommendations on specific topics. She asked what topics would make sense to address in a work group.

**Question:** Is it possible to quantify the effect of converting all or some fraction of on-site septic systems to sanitary sewer service?

**Response (Duane Fagergren):** There is a lot of discussion about the HCDOP-IAAM models ability to show the effect on dissolved oxygen from reducing the load of nitrogen from, say, 2.4 MT/month to 1.0 MT/month. There is an interesting dance between what is technologically feasible on the ground and what the models can detect. We need practical advice from the models as to what will make a difference in dissolved oxygen concentrations.

**Response (Jan Newton):** The modelers need to know what kind of corrective actions are in the universe of possibility. The watershed model might be helpful, but the scientists don’t know what the options are for corrective or management actions.

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**Comment:** Another consideration, in addition to reducing nitrogen inputs, is to directly reduce the growth of algae, or catch the algae before it dies and decomposes. We could consider using forage fish to reduce algae.

**Response (Duane Fagergren):** Using filter feeders was a recommendation in the PACA report. This group could consider beneficial biota.

**Comment:** We need to reform our land use law to prohibit things like building homes on bulkheads.

**Question:** What is the point of outreach and education related to on-site septic systems? People have to use their plumbing.

**Response (John Eliasson, Washington State Department of Health):** One example is to encourage people not to use a garbage disposal.

**Question:** Has anyone quantified the effect of a property owner trying through behavior change to reduce nitrogen inputs to a functioning on-site septic system?

**Response (John Eliasson):** It is difficult to measure, but studies show that nitrogen is reduced by about five percent when people stop using their garbage disposals.

**Question:** How does delisting work?

**Response (Tom Eaton):** Delisting occurs when monitoring and modeling show that water quality standards have been met. In this case, there is not an absolute numerical standard that must be met, but a decrease in human pollution.

**Question:** So, is attainment of water quality standards met by tracking changes in effluent streams and non-point sources, and reflecting the effect of those changes in a model, as opposed to seeing the changes in the marine environment?

**Response (Tom Eaton):** Essentially, yes. You need to take a Best Management Practice approach that you can quantify on a large scale. For example, if out of 10,000 on-site septic systems, 3,000 are diverted to a wastewater treatment plant and 1,000 are upgraded, you can estimate the amount of nitrogen removed and model the impact on dissolved oxygen.

**Question:** Is it necessary for the model to satisfy a particular performance standard, so you have enough confidence in its accuracy to rely on it for delisting?

**Response (Tom Eaton):** EPA has prescriptive guidance for setting up a model under a TMDL approach. Here, in the absence of a TMDL, the modelers have taken a different, though similar approach, which is fine. The model does need to be appropriately predictive, though.

**Comment:** The model can tell you how much nitrogen needs to be removed to get the human influence down to 0.2 mg/L. It is up to us to decide how to get that reduction.

**Question:** What goals and measurements of progress are needed in an action plan for the EPA to accept it?

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The meeting participants discussed whether it was appropriate take a TMDL approach to low dissolved oxygen, or to pursue an action plan similar to a TMDL. Doing a TMDL would require that the model adhere strictly to the EPA guidance. The group agreed that following the TMDL approach template, without doing a formal TMDL, is the recommended approach.

The meeting participants agreed that Dr. Newton had summarized the right topics for sub groups in her PowerPoint presentation. The topics are as follows:

- Wastewater, including on-site septic systems
- Land use including housing, stormwater, development, and growth management
- Agriculture
- Forestry
- Riparian corridor health, restoration and protection
- Nearshore health, restoration and protection
- Communications, public education, and outreach strategy

Attendees agreed that the communication, public education, and outreach strategy element could probably be addressed after the other topics had begun or were completed.

### **Part B: Evaluation Methods:**

- **Opportunities & limitations for using HCDOP IAM models to define and assess actions:**
  - What does it mean to run a scenario and how has IAM used the models up to this point.
  - Discussion of time frame – IAM capabilities in next 7 months and long term

Jan Newton gave a brief presentation about the models that HCDOP IAM scientists have developed to describe the Hood Canal watershed. She described the citizen monitoring that has contributed to the research effort, noting that citizen monitoring provides an opportunity for outreach. She pointed out that even if Hood Canal were in compliance with the dissolved oxygen standard, hypoxia events may still occur.

Dr. Newton explained how the models could be used to test a “scenario,” or in other words, a specific set of conditions. She gave an example of running the model with the condition that nitrogen from on-site septic systems is reduced by 30% to test the effect on dissolved oxygen.

Scott Bechtold said that the greatest uncertainty in the model is in partitioning the contribution of nitrogen among human sources, such as red alders vs. on-site septic systems.

**Question:** Can we run the model with the assumption that four sanitary sewer projects will be built in lower Hood Canal?

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**Response (Scott Bechtold):** Yes. The model has a cell size of 100 meters by 100 meters. That scale works for sewer projects, but not for individual on-site septic systems.

**Question:** Can you simulate the removal of alder in the model, to help us understand how much nitrogen alder is contributing?

**Response (Scott Bechtold):** We have tried, but it is complicated. Most estimates of nitrogen fixation by alders are based on the amount of nitrogen that stays in the soil. But we want to know what amount of nitrogen leaves the soil. We have based our assumptions on a study that was conducted in the Oregon coast range that assumes a third of the nitrogen that is fixed leaches out. We think that estimate is probably low.

**Question:** How did you “turn off” alder in the model?

**Response (Bechtold):** We changed everything that was alder to coniferous forest.

**Question:** Can you run the model assuming half the application rate of home fertilizer?

**Response (Bechtold):** That is too fine a scale. We have combined home fertilizer and pet waste into a category called “domestic.” We can turn “domestic” inputs off and on in individual watersheds.

**Question:** How many different parameters can you test at a time? Could you test the impact of certain septic, impervious surface, and pet waste conditions in one scenario?

**Response (Scott Bechtold):** We could, but we have not done so.

**Question:** How do you account for future practices in the model, not just current practices?

**Response (Jan Newton):** The watershed is divided into squares and each square is assigned a zoning category and a level of impervious surface, which model uses to calculate nitrogen flux. We can add assumptions to the model about how the zoning and level of impervious surface change over time.

**Question:** Can we tell the model that we want to reach a total human influence on dissolved oxygen of 0.2 mg/L and ask how much of a reduction in one or more parameters is necessary to reach that concentration?

**Response (Scott Bechtold):** Yes, that is possible and the model will give you numbers. As with all environmental decisions, there is uncertainty. The models will give you numbers that are educated guesses based on assumptions we have made.

**Response (Jan Newton):** To reiterate, the model is only as smart as we are. It would be better to give the scientists realistic corrective actions to test and we can give you the expected impact on low dissolved oxygen.

**Comment:** There is a linear relationship between nitrogen inputs and dissolved oxygen concentrations. If we want the summertime human influence on dissolved oxygen concentration to go from 0.8 mg/L to 0.2 mg/L, we need to reduce nitrogen inputs by 75%.

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**Comment:** Remember that the 0.8 mg/L is the contribution only of on-site septic and other “domestic” inputs, not of other human influences.

**Question:** If nitrogen inputs from alder trees were reduced by 75%, would that be an extra bonus on top of a 75% reduction in domestic inputs? Or is alder included in “domestic.”

**Response (Al Devol):** Reducing the 2.4 MT/month of nitrogen by 75% will get you to a human influence on dissolved oxygen of 0.2 mg/L.

**Response (Tom Eaton):** All human inputs count toward the water quality standard.

**Response (Mitsuhiro Kawase):** There is a question about the sensitivity of dissolved oxygen to nitrogen reduction.

**Question:** Does the water quality standard of not exceeding a human influence of 0.2 mg/L apply to all of Hood Canal, or just certain sections? If we reduced alders in the mainstem of the canal, could we do less in lower Hood Canal?

**Response (Tom Eaton):** Usually you have to meet the standard in the most sensitive area. So, for your example, if reducing alders in the mainstem does not reduce the human influence on dissolved oxygen in lower Hood Canal, then it would not affect the actions needed in lower Hood Canal.

**Response (Kim McKee):** The listing is based on the sampling location, so you would have to sample at the same location to determine if standard is met.

**Response (Jan Newton):** We will look up and provide information about the location of the samples.

**Question:** Are there scenarios we want the modelers to work on between now and our next meeting?

**Response (Jan Newton):** Because running the HCDOP-IAM models is resource-intensive, it probably makes more sense to wait to run scenarios until the TAC has agreed on a specific set of scenarios.

## Discussion of Next Steps

Scott Brewer, Executive Director of the Hood Canal Coordinating Council, described three next steps that the TAC can expect:

- 1) Preparation and distribution of a meeting summary,
- 2) Presentation of key recommendations from the TAC to the Hood Canal Coordinating Council Board of Directors on September 16, and
- 3) Future work group meetings to address the topics that the TAC selected.

In response to a question about the pace of the TAC process, Mr. Brewer said that the whole TAC process would likely last about two years. He said that by end of 2009, the TAC is anticipated to develop a detailed approach to preparing an action plan. By

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October 2010, the TAC is anticipated to be far enough along in identifying specific tasks and activities that policy makers will be able to use the draft action plan to seek funding.

The meeting was adjourned at 4:25 p.m.

## **Attendance**

(see attached sign-in sheets)